Amendments to the Specification:

This version of paragraph 53 will replace all prior versions and listings, and contains no new subject matter therein:

[0053] For both apparatus and all algorithms, however, the operating principle is the same: Firstly, the mass of inner ring 714 is oscillating under springs 712 and springs 752, where spring 752 is coupled to ring 714 by electromagnetic forces due to applied current(s). This oscillation dampens torsional vibrations of shaft 705. Secondly, motion-to-signal transducers (e.g. accelerometers) identify undesired harmonic motion, in inner ring 714 relative to sheath 770. Thirdly, calculations are made on transducer output in order to determine an output that will yield a corresponding dampening spring stiffness improvement i.e. those applied current changes that, as a result of a change of total effective spring constant (for oscillation), improve dampening of the detected undesired harmonic motion. Finally, those current changes are applied (feedback). The electromagnetic feedback solutions described herein amount to controlled passive, semi-active and active rather than passive elements of the overall mechanical system, whereas the spring-mass systems described previously are passive elements. <u>The active element is, of course the combination of electromagnetic apparatus 800 and 900 with ring 714 and sheath 770.</u>

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

Claim 1 (Previously presented): A damper for mitigating torsional vibrations of a shaft, rotating with an angular velocity about a longitudinal axis, and rotating perpendicular to a plane of rotation, said damper comprising:

at least one passive damping element, and

one active element.

Claim 2 (Withdrawn): The damper of claim 1 wherein said at least one passive damping element comprises:

a spring having a spring constant of proportionality with respect to motion in a first degree of freedom,

a mass coupled to said spring for oscillation along said first degree of freedom, wherein said oscillation dampens said torsional vibrations of said shaft corresponding to a frequency of said oscillation,

a selector coupled to said spring for movement along said spring in a second degree of freedom, said movement under governance of said angular velocity of said shaft, such that said spring constant of said spring, for said oscillation, is selected.

Claim 3 (Withdrawn): The damper of claim 1 wherein said at least one passive damping element comprises:

a joint, displaced from said longitudinal axis, and in said plane,

a pendulum having a degree of freedom for pendulum motion, about said joint, said motion in said plane, such that said pendulum motion dampens said torsional vibrations corresponding to the frequency of said pendulum motion.

Claim 4 (Withdrawn): A damper for ameliorating torsional vibrations of a shaft, rotating with an angular velocity, said damper comprising:

a spring having a spring constant of proportionality with respect to motion in a first degree of freedom,

a mass coupled to said spring for oscillation along said first degree of freedom, wherein said oscillation dampens said torsional vibrations of said shaft corresponding to a frequency of said oscillation,

a selector coupled to said spring for movement along said spring in a second degree of freedom, said movement under governance of said angular velocity of said shaft, such that said spring constant of said spring, for said oscillation, is selected.

Claim 5 (Withdrawn): The damper of claim 4 wherein said frequency is a constant multiple of said angular velocity.

Claim 6 (Withdrawn): The damper of claim 5 wherein said frequency is a constant multiple of said angular velocity by a natural number.

Claim 7 (Withdrawn): The damper of claim 4, wherein said selector is said mass.

Claim 8 (Withdrawn): A damper for reducing torsional vibrations of a shaft, rotating about a longitudinal axis, and perpendicular to a plane of rotation, said damper comprising:

a joint, displaced from said longitudinal axis, and in said plane,

a pendulum having a degree of freedom for pendulum motion, about said joint, said motion in said plane, such that said pendulum motion dampens said torsional vibrations corresponding to the frequency of said pendulum motion.

Claim 9 (Withdrawn): The damper of claim 8 wherein said frequency is a constant multiple of the angular velocity of said shaft.

Claim 10 (Withdrawn): The damper of claim 9 wherein said frequency is a constant multiple of the angular velocity of said shaft by a natural number.

Claim 11 (Original): A damper for reducing torsional vibrations of a rotating shaft, said damper comprising:

a first spring,

a second spring,

a mass physically coupled to said first spring and electromagnetically coupled to said second spring for oscillation having a frequency, wherein said oscillation dampens said torsional vibrations of said shaft that correspond to said frequency,

accelerometers coupled to the mass and the shaft for detecting the relative motion of said mass and said shaft,

a current generator for adjusting an electromagnetic bond whereby the second spring is coupled to the mass,

a computer coupled to said accelerometers and said current generator for detecting at least one undesired torsional vibration, determining a corresponding dampening spring stiffness improvement, and signaling current generator to adjust current in order to implement said improvement.

Claim 12 (Original): The damper of claim 11 wherein said computer further comprises apparatus for calculating frequency and amplitude of said mass and said shaft oscillation, and phase differential between said mass to said shaft.

Claim 13 (Previously presented): The damper of claim 11 wherein said computer further comprises at least one spectrum analyzer per accelerometer.

Claim 14 (Previously presented): A method for damping torsional vibrations of a rotating shaft wherein said shaft includes a hub, a mass physically coupled to said hub via a first spring and coupled to said hub via a second spring and electromagnetic bond, said method comprising:

(i) oscillating said mass angularly with respect to said hub in a manner that absorbs energy with a resonance related to the total effective spring constants of the first and second springs,

(ii) identifying undesired harmonic motion in said mass relative to said hub,

(iii) calculating applied current changes that, when applied by a current generator to said electromagnetic bond, change the total effective spring constant and improve dampening of the detected undesired harmonic motion, and

(iv) applying said current changes.

Claim 15 (Previously presented): The method of claim 14 wherein step (iii) comprises calculating a current decrease if amplitude of oscillation of said hub is increasing and amplitude of oscillation of said mass is decreasing, calculating a current increase if oscillation of said hub is decreasing and oscillation of said mass is increasing, and calculating no applied current change if oscillation of said hub and oscillation of said mass are constant.

Claim 16 (Previously presented): The method of claim 14 wherein step (iii) comprises calculating a current decrease and mass amplitude increase if the amplitude of oscillation of said hub is increasing and, calculating a current increase and mass amplitude increase if oscillation of said hub is decreasing, and calculating no applied current change if oscillation of said hub is constant.

Claim 17 (Previously presented): The method of claim 14 wherein step (iii) comprises calculating current changes that will generate an additional harmonic force with a frequency equal to frequency of actual external force, and phase equal to − [[90 0]] 90 degrees.

Claim 18 (Previously presented): The method of claim 14 wherein said (ii) identifying is performed by an apparatus including a motion-to-signal transducer.

Claim 19 (Previously presented): The method of claim 18 wherein said motion-to-signal transducer includes an accelerometer.

Claim 20 (Previously presented): The method of claim 18 wherein said motion-to-signal transducer includes a frequency detector.

Claim 21 (Previously presented): The method of claim 18 wherein said motion-to-signal transducer includes a spectrum analyzer.

Claim 22 (Withdrawn): The damper of claim 1 wherein said at least one passive damping element comprises:

a spring having a spring constant of proportionality with respect to motion in a first degree of freedom,

a mass coupled to said spring for (i) oscillation along said first degree of freedom, wherein said oscillation dampens said torsional vibrations of said shaft corresponding to a frequency of said oscillation, and (ii) movement along said spring in a second degree of freedom, said movement under governance of said angular velocity of said shaft, such that said spring constant of said spring, for said oscillation, is selected.

Claim 23 (Withdrawn): A damper for mitigating torsional vibrations of a shaft, rotating with an angular velocity, said damper comprising:

a spring having a spring constant of proportionality with respect to motion in a first degree of freedom,

a mass coupled to said spring for (i) oscillation along said first degree of freedom, wherein said oscillation dampens said torsional vibrations of said shaft corresponding to a frequency of said oscillation, and (ii) movement along said spring in a second degree of freedom, said movement under governance of said angular velocity of said shaft, such that said spring constant of said spring, for said oscillation, is selected.

Claim 24 (Withdrawn): The damper of claim 22 wherein said frequency is a constant multiple of said angular velocity.

Claim 25 (Withdrawn): The damper of claim 23 wherein said frequency is a constant multiple of said angular velocity by a natural number.

Claim 26 (Withdrawn): The damper of claim 1 wherein said at least one passive damping element comprises:

at least two springs having two spring constants of proportionality with respect to motion in a first degree of freedom,

a mass coupled to said two springs for oscillation along said first degree of freedom, wherein said oscillation dampens said torsional vibrations of said shaft corresponding to a frequency of said oscillation, and

wherein said mass is coupled to said two springs for movement in a second degree of freedom, said movement under governance of said angular velocity of said shaft, such that the moment of inertia of said mass about said shaft is governed by said angular velocity.

Claim 27 (Withdrawn): The damper of claim 1 wherein the controlling damping element is capable of damping at least one vibration of a frequency different from any resonant frequencies of the passing damping element.